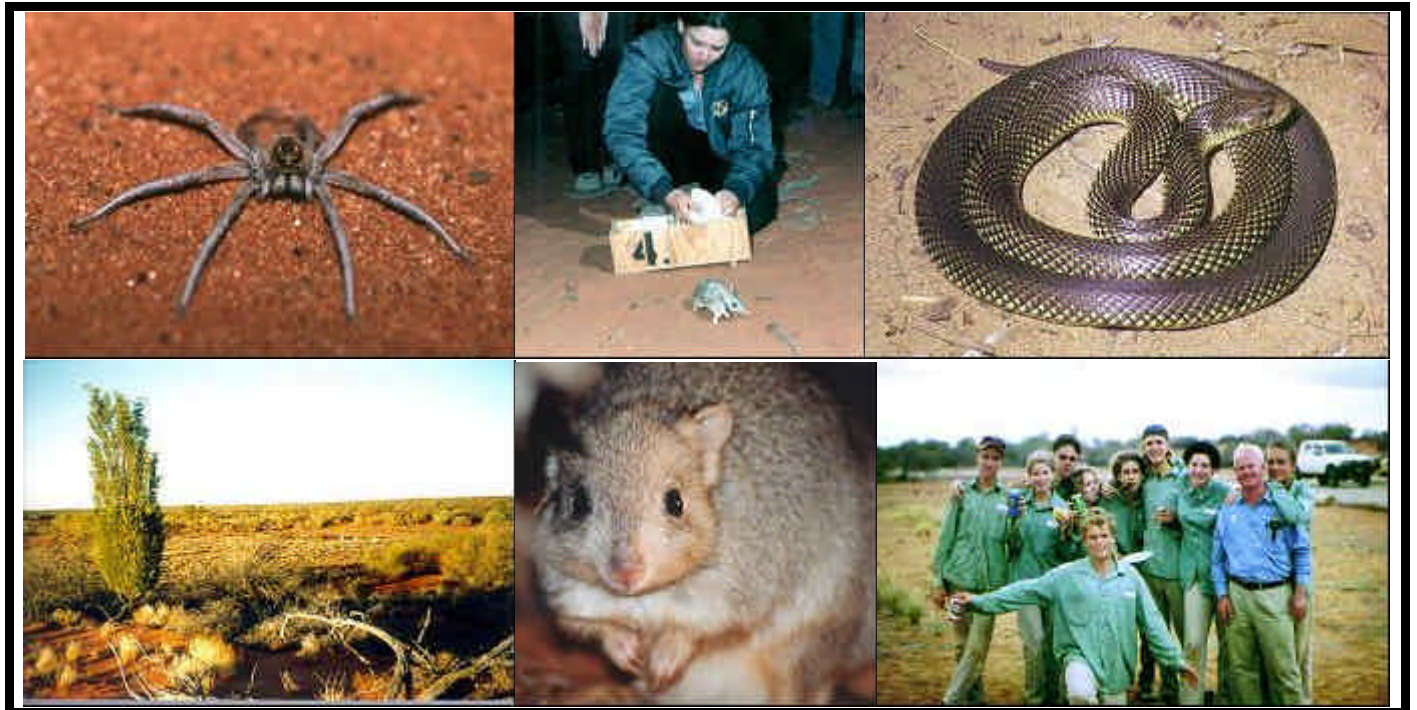


# The Arid Recovery Project



## Annual Report 2001



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# Mission Statement

**To facilitate restoration of arid zone ecosystems through on ground works, applied research and industry/community partnerships .**

## Project Summary

The Arid Recovery Project is a joint conservation initiative between WMC Resources, Friends of the Arid Recovery Project, the Department for Environment and Heritage (DEH) and the University of Adelaide. The project was implemented in June 1997 to take advantage of rabbit numbers reduced by calicivirus, by removing feral animals from an arid zone landscape. The entire 60km<sup>2</sup> Arid Recovery Reserve, which is located 5km north of the Olympic Dam mine in northern South Australia, is now completely enclosed within a rabbit, cat and fox-proof fence. The project aims are as follows:

- 1) To facilitate ecological restoration of arid ecosystems through:
  - Removal and exclusion of feral animals
  - Recovery of existing native vegetation
  - Re-establishment of threatened species
  - Adaptive management based on monitoring outcomes
- 2) To monitor and research the processes of ecological restoration and provide transferable information and resources for environmental management of Australia's arid lands including;
  - Arid zone recovery trends and techniques
  - Re-introduction and rehabilitation protocols
  - Cost-effective large-scale feral animal control
  - A source of acclimatised animals for other arid zone re-introduction sites
- 3) To demonstrate how mining, pastoralism, tourism and conservation organisations can work together to achieve sustainable ecological outcomes.
- 4) To provide education and training opportunities which will:
  - increase community and industry awareness of arid zone conservation issues
  - encourage and develop arid zone restoration ecologists

The project depends heavily on volunteer labour and is assisted by the local community, conservation organisations, students and indigenous groups. An Arid Recovery Committee oversees the running of the project with a member of each founding organisation represented. The Arid Recovery Project has been planned in stages to allow monitoring of project progress. Project stages and their progress are outlined in Table 1.

Table 1: Project stages and current progress

Stage no.	Details	Start date	Finish date	Results so far
1	Construction of a 14km <sup>2</sup> enclosure	August 1997	January 1998	<i>Exclosure constructed by contractors and volunteers</i>
2	Removal of rabbits	October 1998	January 1999	<i>All rabbits removed from exclosure after over 8000 hours of volunteer effort</i>
3	Establishment of a plant and animal monitoring system	August 1997	April 1998	<i>Plant sites established with DEH; Animal sites established with Adelaide University</i>
4	Electrification of the fence and removal of cats and foxes from main enclosure	January 1999	March 1999	<i>Audio lures used to eradicate the last cat. No breach of fence to date.</i>
5	Re-introduction of between 3 and 5 nationally threatened species	April 1999	April 2000	<i>Greater Stick-nest Rats in April 1999; Bettongs in October 1999; Bilbies in April 2000, Western Barred Bandicoots in 2001</i>
6	Establishment of a regional buffer zone	January 1999	ongoing	<i>Aerial baiting to begin in 2002.</i>
7	Increase the size of the Reserve to 60km <sup>2</sup>	May 1999	Dec 2000	<i>First(8km<sup>2</sup>), second (8 km<sup>2</sup>) and third (30km<sup>2</sup>) expansion areas fenced.</i>
8	Remove all rabbits, cats and foxes from the expansion areas of the 60km <sup>2</sup> Reserve	May 1999	Dec 2001	<i>All cats and foxes were eradicated from the Reserve by April 2001. Over 4000 rabbits have been eradicated from the Reserve.</i>
9	Increase community awareness and participation in arid zone conservation	June 1999	ongoing	<i>Viewing hide and walkway constructed. Information displays, brochures, talks, attendance at expos, festivals, field days etc. Over 200 items of publicity generated to date. Site based eco-tours to begin in 2002</i>

## Major Achievements in 2001

During 2001, many achievements were made at the Arid Recovery Project. The most notable achievements include:

- **Completely eradicating rabbits from the entire 60km<sup>2</sup> Reserve area.** *Rabbit control has been continuing within the 30km<sup>2</sup> northern expansion area for the last 18 months with the last rabbit removed in December 2001. The northern expansion area proved the most difficult for rabbit eradication due to its large size (twice that attempted previously) and high rabbit densities.*
- **Re-introducing the Western Barred Bandicoot.** *The western barred bandicoot was re-introduced back into the Reserve in May 2001 after 6 months of quarantine at Adelaide Zoo. To date, 14 pouch young have been recorded with at least 6 of these captured since pouch exit.*
- **Re-introducing bettongs, bilbies and stick-nest rats into the first expansion area** *Six months after removing the last cat from the Reserve in February 2001, stick-nest rats, burrowing bettongs and bilbies were transferred into the first 8km<sup>2</sup> expansion area. To date, all translocated animals are alive and breeding has commenced.*
- **Constructing a viewing hide and guided walkway for guided tours starting in 2002.** *2002 is the Year of the Outback and guided tours of the Reserve will commence. Tours will include time in the recently constructed viewing hide which has both underground and above ground viewing areas.*



**Project officer, Katie Oxenham, with the last rabbit captured within the 60km<sup>2</sup> Reserve in December 2001**



**The above and below-ground viewing hide built within the First Expansion area. Tours to the Reserve will begin in 2002.**

## Project Team

The project team is made up of committee members and project officers. The Project supports two full time positions made up of one Project Coordinator and part time project officers. Research students from Universities around Australia also conducted research projects within the Reserve in 2001.

### *Staff*

Katherine Moseby- Project Coordinator  
Nicki Munro- Interim Project Coordinator, Project Officer  
Katie Oxenham- Interim Project Coordinator, Project Officer  
Andrew Freeman- Feral Animal Control Officer  
Kerrily Blaylock- Casual Project Officer  
Judith Carter- Casual Project Officer

### *Committee members in 2001*

Katherine Moseby- Friends of the Arid Recovery Project representative  
Dr John Read- WMC Land Management representative  
Peter Copley- Department for Environment and Heritage (NP&W S.A.) representative  
Dr David Paton- University of Adelaide representative  
Keith Ashby/Steve Green- WMC Environment Dept. representative

### *Research students*

Erin O'Donnell- University of Adelaide  
Rob Selfe- University of Adelaide  
Aaron Greenville- University of Sydney  
Shannon Sparkes - University of Adelaide  
Jane Edwards- University of Adelaide

## Arid Recovery Reserve

The Arid Recovery Reserve comprises 60km<sup>2</sup> of arid land (Figure 1). Many habitats are present within the Reserve including chenopod (saltbush/bluebush) inter-dunal swales, *Acacia* dunes, native pine and mulga sandplains, canegrass swamps, canegrass dunes and claypans. The area is bordered to the north by the Dog Fence, the east by the Borefield road and to the south by the Olympic Dam Special Mine Lease. The Reserve is situated partly on the Mine Lease (7km<sup>2</sup>) and partly on adjoining pastoral properties including Roxby Downs Station (49km<sup>2</sup>) and Stuart Creek Station (2km<sup>2</sup>) leased by WMC Resources, and privately leased Mulgaria Station (1km<sup>2</sup>) and Billa Kalina Station (1km<sup>2</sup>). The project is within the boundaries of three soil conservation board districts namely Kingoonya, Marla-Oodnadatta and Marree. In order to facilitate manageable and effective rabbit control, the Reserve was gradually fenced in sections until the whole 60km<sup>2</sup> was finally enclosed in December 2000. The area is divided into a main 14km<sup>2</sup> electrified enclosure where endangered species are first re-introduced, two 8km<sup>2</sup> expansion areas adjoining the main enclosure and a northern 30km<sup>2</sup> expansion area. The entire 60km<sup>2</sup> Reserve is now free of all rabbits, cats and foxes. The northern boundary of the project is now part of the Dog Fence and was re-aligned with assistance from the Dog Fence Board in 2000.

# Feral animal control

## Rabbits

Spotlight transects indicate that rabbit densities outside the Reserve increase periodically but have still not reached pre-RCD levels (Fig. 2 and 3). Recent spotlight counts estimate rabbit density at 40 per km<sup>2</sup> but spotlight counts underestimate true rabbit density and should be used as an indication of temporal trends only. The recent increase in rabbit numbers suggests there was a 3 year “window of opportunity” between 1997 and 1999 when rabbit numbers remained consistently below 20 per square km. The Arid Recovery Project was able to complete the majority of rabbit eradication during this time but eradication gradually became more time consuming and less efficient as numbers increased. It is likely that complete rabbit eradication would have been unachievable at current rabbit densities.

Rabbits were completely eradicated from the northern expansion in 2001. It is estimated that over 4000 rabbits were eradicated from this area through poisoning, warren fumigation and trapping. Based on spotlight counts and the presence of dead rabbits on warrens, RCD is thought to have led to mass die off of rabbits on at least two occasions in 2001, in late Winter and again in Spring (Fig.3). Rabbit control is now being conducted in a 500m buffer zone around the Arid Recovery fenceline.

**Rabbit Densities at Roxby Downs**

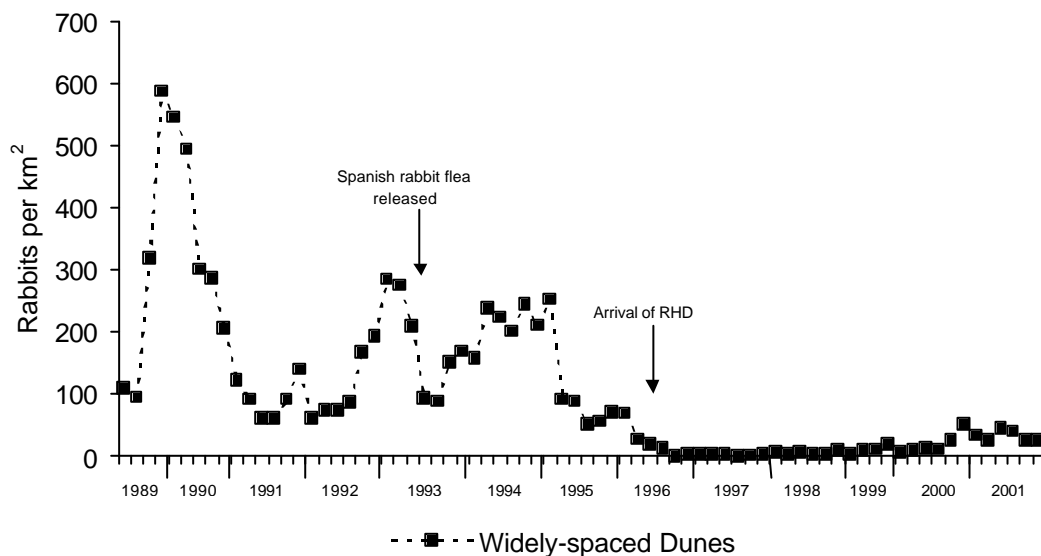


Figure 2: Rabbit Densities at Roxby Downs showing decline after the arrival of RCD.



### Rabbits Numbers Since the Arrival of RCD

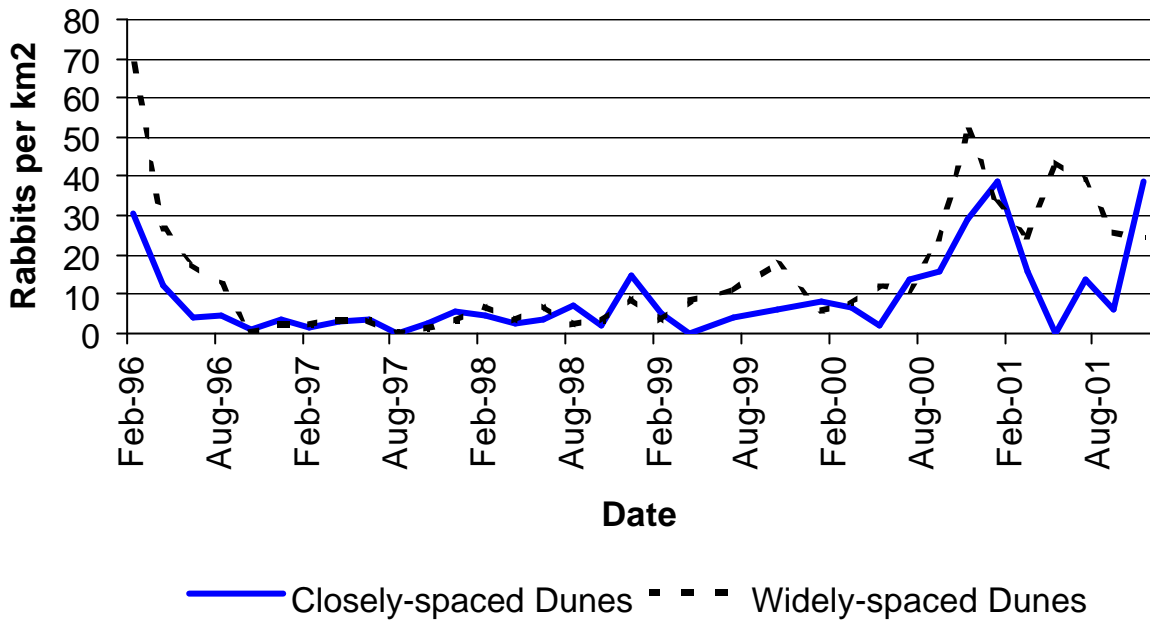


Figure 3: Rabbit density (no. per km<sup>2</sup>) spotlight counts conducted by WMC staff since the arrival of RCD in 1996. Shown at a lower scale to illustrate post RCD increases in rabbit density.

### Cats and foxes

Cats and foxes were completely eradicated from the main 14km<sup>2</sup> enclosure in 1998 and the entire Reserve in early 2001. No cats or foxes have since gained access to Reserve. Up to 10 audio lures and soft leg-hold traps are permanently set outside the 34km Reserve fence and are checked daily using remote telemetry tracking. During 2001, 19 cats and 25 foxes were captured using this method (trap nights 3012, trap success 1.46%). The 2001 trap success was double that recorded in 2000 when only 11 cats and 14 foxes were captured (trap nights 3260, trap success 0.77%). A further 14 cats and 1 fox were shot and two cats cage trapped increasing the total number of feral animals removed from around the Reserve fence to 61 individuals in 2001. The slightly higher number of cats than foxes captured in 2001 using lures and leghold traps is consistent with WMC Environmental Department spotlight transects, which consistently record higher densities of cats than foxes (long term average is 0.56 per km<sup>2</sup> for foxes compared with 0.73 per km<sup>2</sup> for cats).

Aerial baiting trials for introduced predators will commence in 2002. A 10km buffer zone around the Reserve fence will be baited using 1080 meat baits dropped from a helicopter or small plane. Baiting will be conducted in April 2002 after reptiles become less active. Track transects are being conducted within the 10km baited zone and in control areas remote from baiting. Tracks of predators will be counted before baiting (November 2001, January 2002, March 2002) and after baiting (April 2002, June 2002) to determine baiting efficacy. If aerial baiting is successful it may be adopted on a twice yearly basis and eventually re-introduced animals may be allowed access to areas outside the Reserve via one-way gates.



## Vegetation Recovery

GIS data were used during 2001 to determine if changes in vegetation cover within the Reserve could be detected using satellite imagery. Research conducted by Jane Edwards from the University of Adelaide found that there was a discernable difference in the change of vegetation cover inside and outside the Reserve (Fig.4). Whilst vegetation cover outside the Reserve generally decreased or remained stable between 1988 and 2001, there was a large increase in vegetation cover within the Reserve. The areas of greatest cover loss were around watering points in adjacent pastoral country and directly around the Olympic Dam metallurgical plant.

29 vegetation monitoring sites were established by Arid Recovery staff and Department for Environment and Heritage staff and are monitored annually. These are pastoral reference sites and are used to monitor changes in vegetation cover, diversity and recruitment with the removal of rabbits. Sites are placed both within the Reserve and in surrounding areas. Jessup transects, step point, photopoint and species lists were recorded. However, due to the considerable expansion of the Reserve, some of the original outside sites situated in rabbit and stock areas were incorporated within the Reserve so new sites were established outside the Reserve in 2000 as replacements.

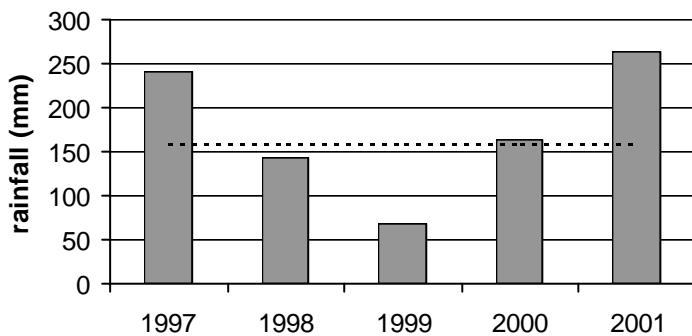


Figure 5: Annual rainfall recorded at the Olympic Dam Mine situated 5km from the Reserve in 1997,1998 and 1999. A rain gauge was established at the site in 2000 and is presented here. Average rainfall is 160mm and is represented by a dotted line.

Vegetation cover is highly dependant on rainfall and annual rainfall in 2001 was above average for the first time since rabbit eradication (Fig.5). Results indicate that the annual dune vegetation showed a response to the removal of rabbits and stock during the dry year of 2000 but surprisingly during the high rainfall year of 2001 no difference was detected (Fig. 6). However, when the two additional dune sites are excluded there is a significant difference between inside and outside sites ( Fig.7). It appears that the new sites chosen in 2000 have naturally higher levels of cover and are not well matched with the original sites. Despite this artefact, the difference between inside and outside sites is most marked during the dry year of 2000 rather than the wet year of 2001. The appearance of many weed species such as *Brassica* and *Salsola* after rain may be masking differences in cover. Additionally, the majority of the rain in 2001 fell in winter so there was little grass response.

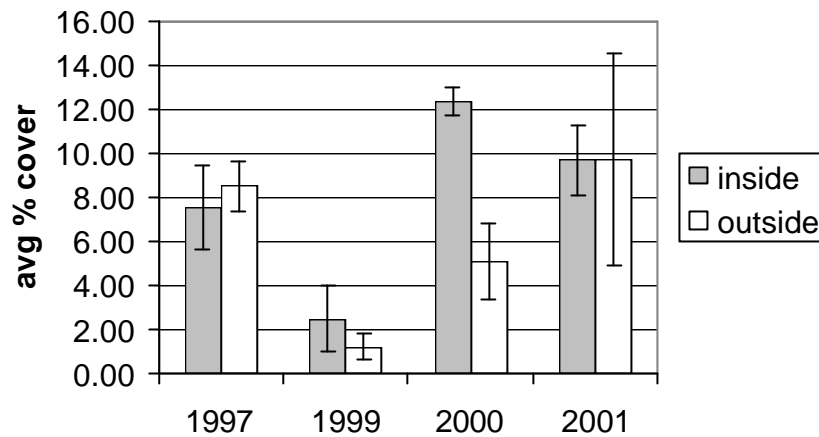


Figure 6 : Cover of annual vegetation at dune sites inside and outside the Reserve. There are 5 inside sites and 5 outside sites.

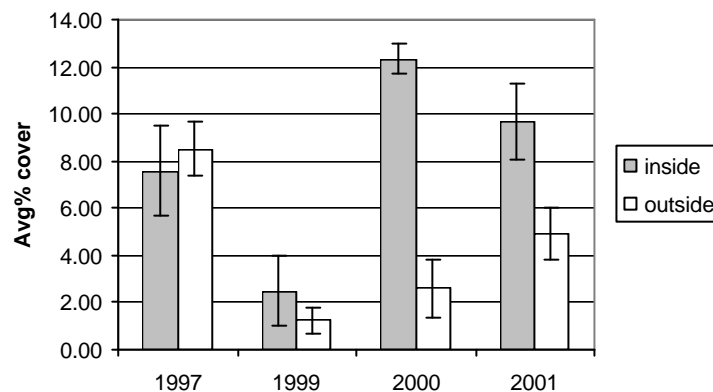


Figure 7 : Cover of annual vegetation at dune sites inside and outside the Reserve. This graph only includes the original 5 inside and 3 outside sites and excludes the two additional outside sites. Standard error bars are much lower without the additional sites.

## Re-establishment of native fauna

At least 27 species of native mammal once inhabited the Roxby Downs region but over 60% have become locally or completely extinct since European settlement. Some bird species have also declined and many plant species are now rare in the Reserve area. The Arid Recovery Project aims to restore as much as possible of the original fauna and flora to the Reserve through natural re-establishment and planned re-introductions. Re-introductions are research-based to enable information to be obtained on how the animals survive in the arid zone and whether long term re-establishment is possible. Some species such as the Spinifex Hopping-mouse have re-established naturally in the Reserve and it is hoped that some rare plant species such as Sandalwood will also increase in abundance.

A sub-fossil deposit found 30km from Roxby Downs was used to determine which mammal species formerly occurred in the region and which could potentially be re-introduced (see

below). Extinct species are in italics, species which have already been re-introduced are in bold and potential species for future re-introduction are underlined. Rare bird species such as the Bush Thick-knee and Plains Wanderer have also been recorded from the Roxby Downs region in the past and could potentially be re-introduced into the Reserve. Woma Pythons are also thought to have been in the area and could potentially be re-introduced as a native predator in the future.

Locally extinct mammal species from the sub-fossil deposit

*Pig-footed Bandicoot*  
*Lesser Stick-nest Rat*  
*Short-tailed Hopping Mouse*  
*Long-tailed Hopping Mouse*  
*Goulds Mouse*  
Greater Stick-nest Rat  
**Burrowing Bettong**  
**Greater Bilby**  
**Western-barred Bandicoot**  
Golden Bandicoot  
Kultarr  
Ampurta  
Common Brush-tailed Possum  
Long-haired Rat

Four threatened mammal species have been re-introduced to the Reserve to date. Re-introductions began in 1998 with the Greater Stick-nest Rat followed by the Burrowing Bettong in 1999, Greater Bilby in 2000 and the Western-barred Bandicoot in 2001. All re-introductions were initially into the main 14km<sup>2</sup> enclosure. During 2001, some bilbies, bettongs and stick-nest rats were translocated from the main enclosure into the first expansion area.

Monitoring of re-introduced species included a trapping transect within the main enclosure established in 2001. One Elliott and one cage trap were set every 200m along tracks within the main enclosure for one night, totalling 84 cage and 84 Elliott trap nights. No captures were made in the Elliotts but 2 stick-nest rats and 24 burrowing bettongs were captured in cage traps, a trap success of 29% for bettongs and 2% for stick-nest rats. New bettongs comprised 58% of captures. A 2m x 2m raked track quadrat was placed more than 20m away from each trap station to determine presence of other species. Three of the 84 quadrats contained bilby tracks (3.5%) compared with 12 (14%) for bettongs and 4 (5%) for stick-nest rats. This contrasts with the track transect data (Fig. 8) which indicate that bilby tracks are most commonly encountered followed by bettongs and stick-nest rats.

## **Greater Stick-nest Rat**

### *Main Enclosure*

The Greater Stick-nest Rat (*Leporillus conditor*) is a native rodent which was once widespread in arid and semi-arid areas. After European settlement stick-nest rats became

extinct on the mainland and survived naturally on only two off-shore islands in S.A. DEH (NP&W SA) conducted a re-introduction program for the stick-nest rat which successfully re-introduced the rats to 3 off-shore islands. However, despite several attempts at re-introduction on the mainland, the Arid Recovery Reserve remains the only successful mainland re-introduction site.

100 Greater Stick-nest Rats were released into the main enclosure in April and June 1999. Rats are monitored through trapping at nest sites, opportunistic trapping and 10km of track transects. Fifty two new rats and 12 recaptures were captured opportunistically during 2001 compared with 31 new Roxby-born rats captured in 2000. Three of the recaptures were original release rats, one from Sept 1998 (over 3 years old) and two from June 1999 (over 2.5 years old). Track transects and radio-tracking data indicate that rats undergo a summer die-off each year followed by a gradual increase in numbers over the winter months after breeding. The unusually long hot summer recorded in 2000/2001 led to a massive die-off of rats. However, high rainfall recorded during 2001 facilitated breeding from March to at least November and track transects indicate an increase from 2.7 tracks per km in March 2001 to 17.9 in November 2001 (Fig8).

Trapping at 17 nest sites has revealed 75 occupants over the last 2 years. All 17 nest sites were active in 2001. Only 3 of the 17 nests contained an individual of more than 12 months residency with the remaining 72 rats not recaptured after 12 months. The highest turnover of rats in nest sites occurred over the summer months. These data suggest that while nests are almost always continuously occupied, occupants either move nests or die on an annual basis. Further trapping is being conducted to explore this theory and genetic studies are underway to determine the relatedness of rats occupying nest sites.

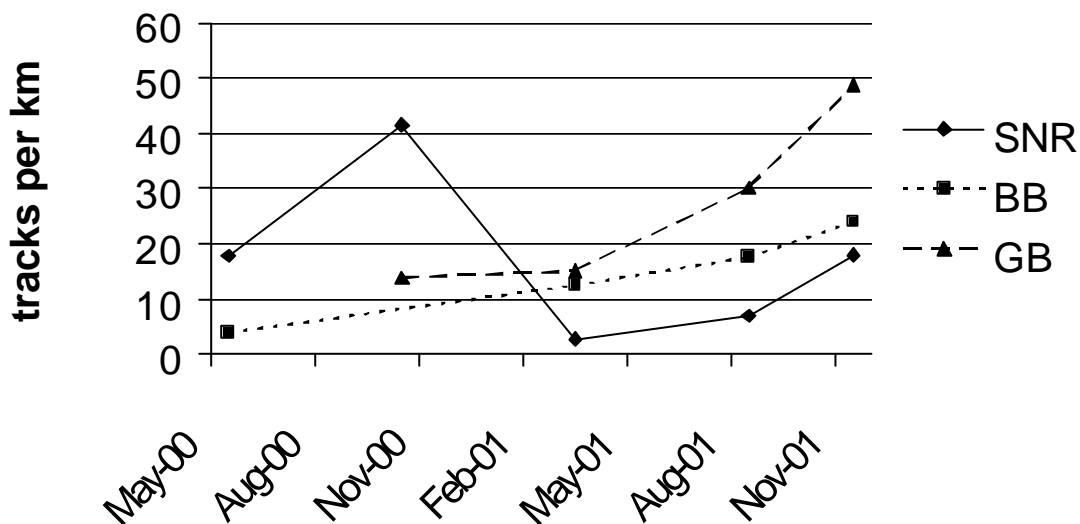


Figure 8 : The number of tracks recorded along 10km of track transects for Stick-nest Rats (SNR), Burrowing Bettongs (BB) and Greater Bilbies (GB).

### *First Expansion Area*

Fifteen stick-nest rats (9 female, 6 male) were translocated from the main enclosure to the first expansion area in August 2001. Although approximately 30 rats were captured for translocation, pregnant and lactating females were released back into the main enclosure at point of capture to ensure the survival of young. Five of the 15 translocated rats were radio-collared and all were released into a thick Lignum swamp in the middle of the expansion area. After two months, all radio-collared rats were alive, one new individual was captured and breeding had commenced. Although one female rat was initially radio-tracked at several different locations throughout the 8km<sup>2</sup> expansion area, all five radio-collared rats eventually sheltered within the Lignum swamp. The probability of cats and foxes gaining access to the first expansion area is higher than the main enclosure due to the absence of electric wires on the fence. However, no cats and foxes have been recorded in the first expansion area since early 2000.

## **Burrowing Bettong**

### *Main Enclosure*

The Burrowing Bettong is an endangered marsupial rat-kangaroo and is the only macropod to live in burrows. The species used to occur in the Roxby Downs area but became extinct on the mainland in the 1940's. Burrowing Bettongs are now present naturally on only 3 off-shore islands in W.A. The Burrowing Bettong (or Boodie) is about the size of a rabbit and eats a variety of foods including insects, roots, tubers, green vegetation, fungi and seed. Old warrens which are thought to have belonged to Burrowing Bettongs have been found within the Reserve and Burrowing Bettong remains were found within a sub-fossil deposit located 30km from Roxby Downs. In October 1999, 10 Burrowing Bettongs (7 female and 3 male) were obtained from Herrisson Prong in Shark Bay, W.A. and released into a 10ha pen inside the main enclosure. The success of this trial release led to the release of a further 20 animals (12 females, 8 males) in September 2000. The full scale release was comprised of bettongs from Bernier Island in W.A.

Females from both the trial and main release have been captured with pouch young and 44 new individuals have been captured. Third generation bettongs have now been recorded and more than 88 warrens have been mapped (Fig 9). Nine warrens have been chosen for collection of long term burrow entrance data. Warrens currently have up to 11 entrances with an average of 5.5. Preferred warren locations are on the base of dunes in hard sand. We now estimate that there are over 100 Bettongs in the main enclosure.

### *First Expansion*

Eight Burrowing Bettongs were translocated from the main enclosure to the first expansion area in August 2001. The four female and four male bettongs were radio-collared and all of the females have subsequently been captured with pouch young. Fourteen burrows have been mapped to date with an average of 4.5 holes per warren. A second translocation of up to 20 animals is planned for April 2002.

## Greater Bilby

### Main Exclosure

Nine Greater Bilbies from the Monarto Captive Breeding Facility were released into a 10ha pen within the main 14km<sup>2</sup> exclosure in April 2000. After one month, bilbies were allowed access to the main exclosure. All five adult females and two of the adult males have been re-captured during 2001 with pouch young present in 94% of female captures. Sixteen new roxby-born individuals have also been captured but trap success and effort have been low and this is not an accurate reflection of population size. Bilbies are trap shy and Burrowing Bettongs are trap happy, entering traps first. However, track transects indicate that the population is growing at steady rate (Fig.8). Tracks and burrows are now found throughout all sand dunes in the main exclosure suggesting that bilbies have colonised all of the available preferred habitat. Information from track transects, reproductive output and burrow density suggest that there are now approximately 100 bilbies within the main exclosure.

Since release, 17 bilbies have been radio-tracked and information on burrow use and home range has been collected. One juvenile bilby dispersed nearly 3km from its natal burrow and might have moved further if the exclosure fence had not halted her dispersal. More than 93 burrows have been used by the radio-tracked bilbies since release and 93% of burrows and 80% of active night fixes were located on dunes (Fig 10). Home ranges of five female bilbies averaged only 0.18km<sup>2</sup> and were considerably smaller than males which averaged 3.16km<sup>2</sup>. Wild-born subadults had smaller home ranges than adults and whilst male home ranges overlapped, females appeared to maintain discrete areas (Fig. 11, 12). At night, females remained closer to diurnal

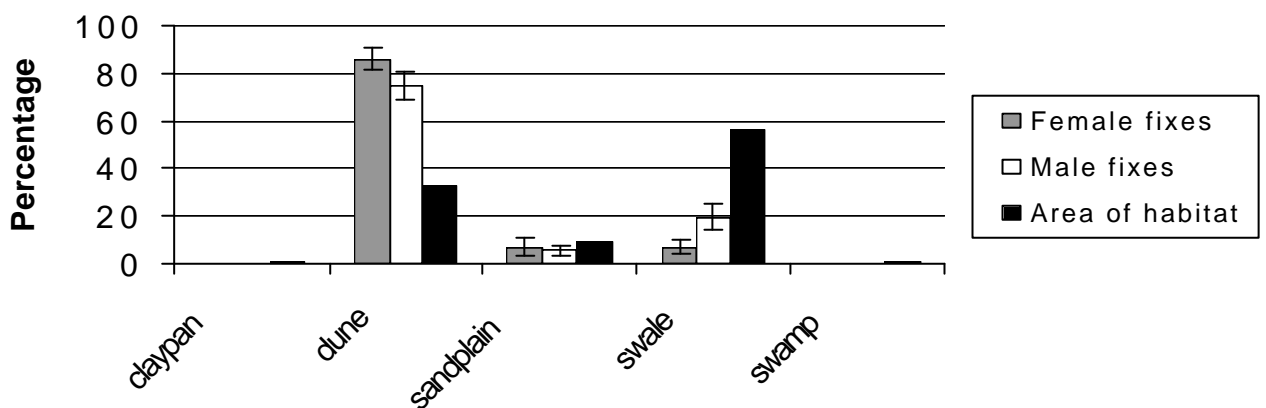


Figure 10: Percentage night fixes recorded in each habitat type for the 5 females and 4 male intensively radio-tracked bilbies. The percentage of each habitat type within the main exclosure is also shown

burrows than males (average 239m vs 560m) and used less swale habitat than males (7% of fixes vs 19.7%). Burrow data indicate that females displayed long term site fidelity with some females re-using burrows after up to 61 weeks. Both males and females re-used a minimum of 30% of burrows, and 42% of burrows were used by more than one bilby over the radio-tracking period. Weights of female bilbies increased and decreased with the growth and emergence of pouch young (Fig. 13). The weights of juveniles all increased at a similar rate (Fig 14).

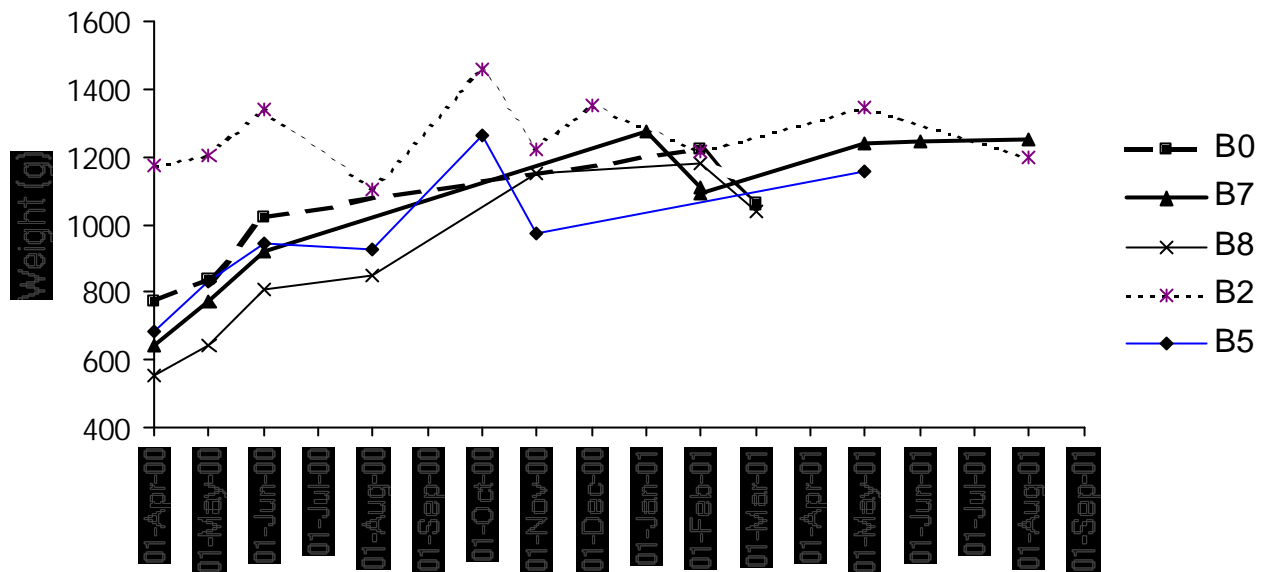


Fig 13 :Weights of the five original release female bilbies. Weight fluctuations are due to the periodic emergence of pouch young

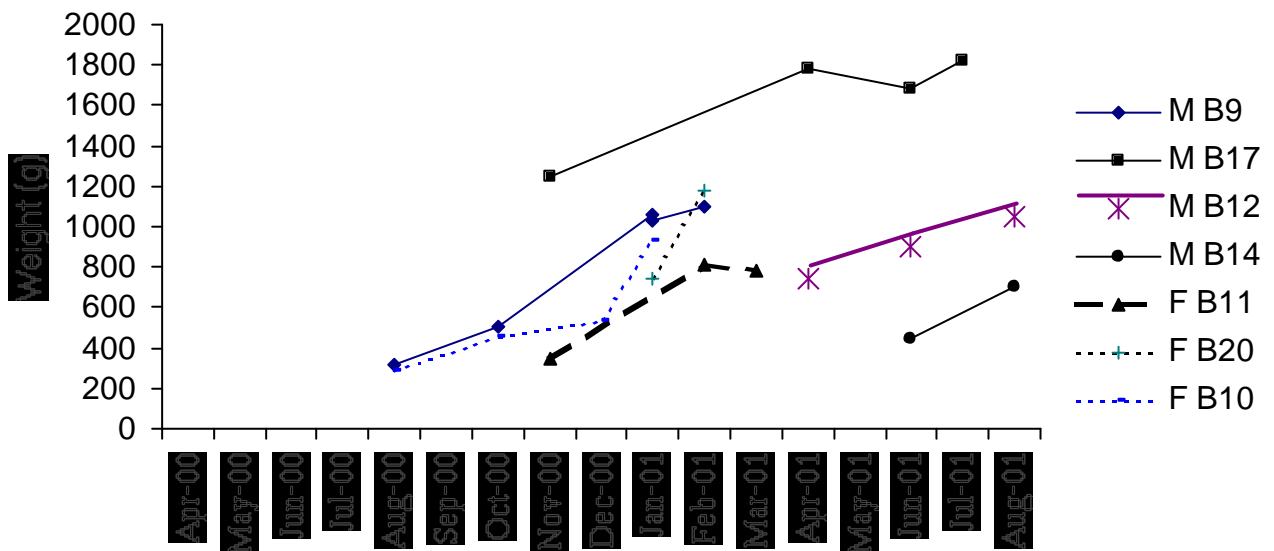


Figure 14:Weights of Roxby-born individuals recaptured during 2001

*First expansion area*

Six bilbies have been released into the first expansion area, four males and two females. Radio-transmitters have been placed on three bilbies but either fell off or were chewed off soon after attachment. Bilby tracks are regularly seen in the first expansion and track transects will be established in 2002.



## Western Barred Bandicoot

Western Barred Bandicoot remains were found within the sub-fossil deposit near Roxby Downs suggesting that they formerly occurred in the region. The species is listed as endangered with less than 3000 remaining in the wild. Western Barred Bandicoots are the smallest of the bandicoots and are only found naturally on Bernier and Dorre Island in W.A.. On September 25<sup>th</sup> 2000, CALM and Arid Recovery staff captured and transported twelve Western Barred Bandicoots from Bernier Island to Roxby Downs. This trial release represented the first release of WBB outside of W.A. After one month, information obtained from W.A with regards to a possible virus on Bernier Island and in captive bred animals prompted the relocation of the bandicoots to Adelaide Zoo for quarantine and observation. Two young were subsequently born in captivity from a female which conceived whilst at Roxby Downs. No other pouch young were recorded during the six month period at Adelaide Zoo. Bandicoots were re-released into the 8ha release pen in early May 2001 and pouch young were recorded one month later. Two deaths have been recorded from feet catching in collars, two from capture myopathy during handling and vet checks, one during recovery from veterinary treatment and one from natural causes. Due to the problems of feet catching in collars and some incidences of neck ulceration, all collars were subsequently removed.

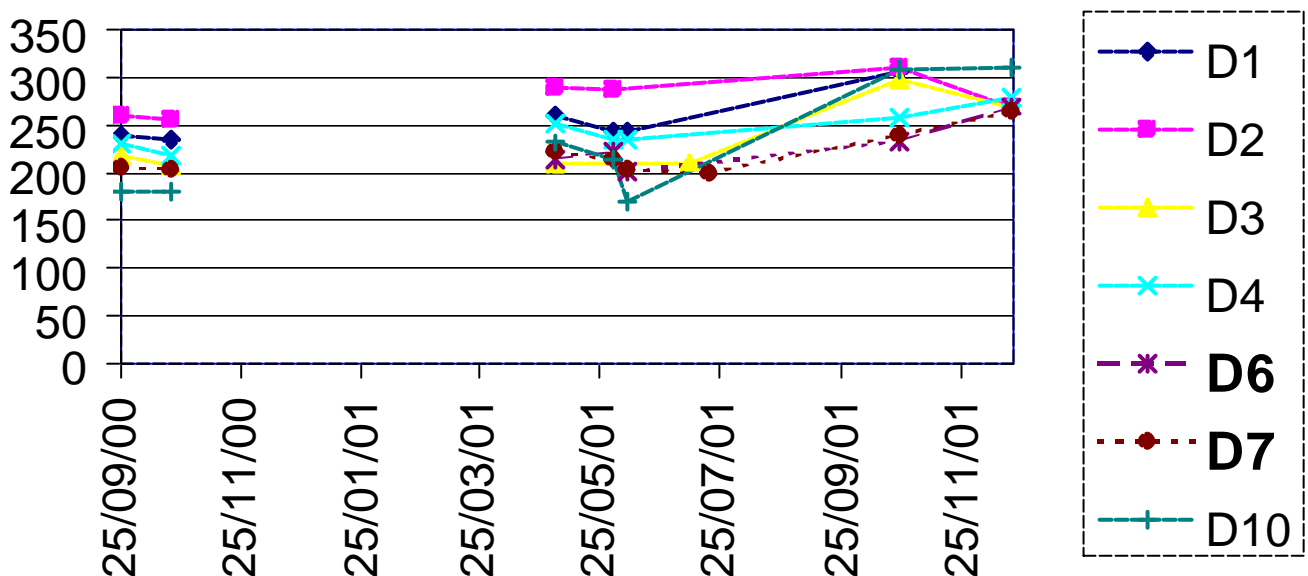


Figure15: Weights of adult bandicoots within the release pen. Male bandicoots are in bold and are represented by dotted lines. Bandicoots were housed at the Adelaide zoo between October 2000 and April 2001

Since the removal of collars and the implementation of a minimal handling policy no deaths have been recorded since June 2001. Fourteen young have been recorded in the pouch and six new individuals have been captured since pouch exit. All adult females have been captured with pouch young and some females had their third set of pouch young in January 2002 since release in May 2001. Bandicoot weights have improved and all bandicoots currently weight more than 250g (Fig.15). The two adult male bandicoots weigh slightly less than the females even when pouch young are not present. Bandicoots are now monitored using track transects (Fig.16), spotlight counts and trapping every two months. Original radio-tracking fixes, spotlight fixes, nest sites and trap site data were pooled to give an indication of home range

for each adult bandicoot. Female bandicoots were found to occupy a discrete area within the 8ha release pen (Fig 17, 18) but their home range overlapped with other females. The two male bandicoots were wider-ranging than the females. Supplementary water and feeding is still being implemented with bandicoots fed a mixture of apple, potato, dog biscuits and carrot three times a week.

An additional 4ha pen was built adjoining the release pen to accommodate the increase in bandicoot numbers and to try to minimise fighting, particularly between males. At present bandicoots have access to both pens via holes in the adjoining walls. Once numbers increase further, some bandicoots will be allowed access to the main enclosure.

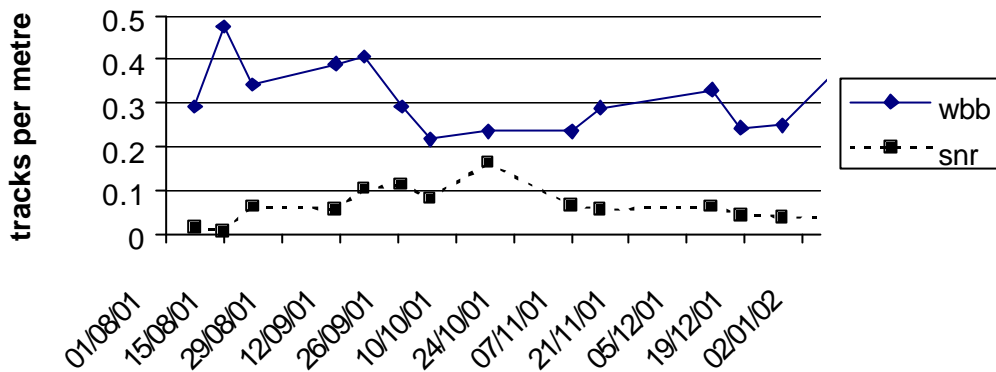


Figure 16: Track transects conducted within the Bandicoot release pen. The second adjacent release pen was added in early October. The opening of the second release pen resulted in a slight drop in tracks per metre due to the increased space available for the bandicoots. WBB= Western Barred Bandicoot, SNR = Stick-nest Rat



A female Western Barred Bandicoot released into the Reserve in 2001. All females have been recorded with pouch young since release.

# Research

Four research papers have been submitted to Scientific Journals with two others in preparation. These journal articles include:

- The comparative dietary preferences of the Greater Stick-nest Rat and European Rabbit- submitted to Australian Journal of Mammalogy, Sarah Ryan and Katherine Moseby. (Funding provided by Nature Foundation S.A.)
- The activity of Sand Goannas and their predation on the re-introduced Greater Stick-nest Rat at Roxby Downs, Northern S.A. Julia Bolton and Katherine Moseby. Submitted to Pacific Conservation Biology in Feb 2001.
- Trial Re-introduction of the Greater Stick-nest Rat in arid South Australia; shelter preferences, home range and impacts on perennial plant species. Katherine Moseby and Jackie Bice. To be submitted to The S.A. Naturalist in early 2002
- Influence of drought, landform and different herbivore grazing on survival of Bladder Saltbush and Low Bluebush. John Read. Submitted to Rangeland Journal in 2001.
- Re-introduction of the Bilby to northern S.A: survival, ecology and notes on re-introduction protocols. Katherine Moseby and Erin O'Donnell. Submitted to Wildlife Research in Jan 2002. (Funding obtained from the Wildlife Conservation Fund)
- The Diet of Burrowing Bettongs and Greater Bilbies re-introduced into the Arid Recovery Reserve, northern S.A.. Jackie Bice and Katherine Moseby. To be submitted to Australian Mammalogy in 2002. (Funding obtained from the Nature Foundation).

Research is currently being conducted by Arid Recovery staff and research scholarship students. Apart from the stick-nest rat nest fidelity study outlined earlier, four other major research studies commenced or continued in 2001;

- *A comparative study on the impacts of Greater Bilby (Macrotis lagotis) and European Rabbit (Oryctolagus cuniculus) digs on vegetation structure in arid South Australia.*  
Shannon Sparkes

This project was conducted during 2002 as partial fulfilment of Honours Environmental Biology at the University of Adelaide. The project compared the amount of seed accumulation and subsequent germination rates between rabbit and bilby digs. Artificial digs were also used to mimic the two species. Both species were found to dig in dune habitat more often than swale or dune edge but there was no pattern with vegetation type or cover. Results indicated that both bilbies and rabbits created shallow, concave digs but bilbies also dug deeper conical digs. The deeper bilby digs trapped a greater mass of plant litter, a larger number of seed and twice as many seed species. Seedling germination was also twice as high in the deeper bilby digs than in controls, rabbit or mimicked rabbit digs. Germinating seedlings were mainly dune species including *Euphorbia* spp., grasses such as *Aristida holathera*, perennial species such as Sticky Hopbush *Dodonaea viscosa* and Sandhill Canegrass, *Zygophyllum billardierei*.



**Bilby diggings at the base of hopbush, *Dodonaea viscosa*, to extract grubs**

- *The comparative use of rabbit, bilby and bettong warrens by native species. Judith Carter, Aaron Greenville, Katherine Moseby, John Read.* Funding obtained by the NHT Rabbit Abatement Program

This project is being conducted by two scholarship students to enable both a summer and winter sampling period. The study investigates which native species of invertebrates, mammals and reptiles use rabbit warrens and whether they also use bilby and bettong warrens. The aim of the study is to identify which species are at risk from rabbit warren destruction and whether replacing introduced burrowers with native ones will minimise the impact. To date, results indicate that small mammals use burrows more often than control sites (areas without burrows) and certain reptile species are found only at sites with burrows. This study will be completed in 2002 and presented as a scientific paper.

- *Control and exclusion of feral cats and foxes in northern S.A.: designing an effective fence and comparing audio and olfactory lures. Katherine Moseby and Rob Selfe*

This continuing study includes work conducted on designing a cat-proof fence using wild-caught feral cats as well as work initiated by a summer scholarship student from the University of Adelaide over summer 2000/2001. The summer scholarship student compared different types of lures to attract cats and foxes to soft-leghold traps. The use of meat lures leads to high captures of non-target species so audio and olfactory lures were trialed. Feline Attracting Phonics obtained from CALM in W.A. which emit a cat meow sound were compared with bird call devices and pongo ( a mixture of cat urine and faeces).

- *Seedling germination and growth rates of selected perennial species under rabbit, cattle and native mammal grazing regimes. Nicki Munro and Katherine Moseby.* Funding obtained from the Native Vegetation Fund

Funding was obtained from the Native Vegetation Fund at DEH to determine the number and growth rate of selected plant seedlings at sites under a variety of grazing regimes. These included rabbit grazing only, cattle and rabbit grazing, grazing by re-introduced mammal species and no grazing by rabbits, cattle or re-introduced species. Plant species targeted were those known to be preferred by rabbits, stock or re-introduced species and include Mulga (*Acacia aneura*), Native Plum (*Santalum lanceolatum*), Native Apricot, Bullock Bush (*Alectryon oleifolius*), Cassia (*Senna artemisioides*), Umbrella Wattle, (*Acacia ligulata*) and Hopbush (*Dodonaea viscosa*). Results to date include an increase in the number of mulga seedlings within adult mulga patches inside the Arid Recovery Reserve compared with rabbit or rabbit and stock sites. This study will be submitted to a journal in 2002.

The following research projects will be implemented in 2002

- *The home range and habitat use of the European rabbit: implications for control. Anthony Pieck.* Funding obtained from the NHT rabbit abatement program

Most control methods for rabbits rely on warren occupancy during control. Despite being a nocturnal mammal, rabbits are often found above ground during the day. This study uses radio-tracking to determine patterns of activity and home range in order to assess the optimum timing for rabbit control. Correlations between activity and temperature, and home range size and sex and will be determined. The project also investigates the efficiency of control methods by comparing mortality between fumigation, poisoning and warren destruction.

- *Using remote scanning technology to investigate burrow activity of Greater Bilbies: Can population size be estimated by counting active burrows?*

Bilbies are difficult to trap in the Arid Recovery Reserve due to trap shyness and Burrowing Bettongs entering traps first. Population size needs to be estimated using alternative methods such as track transects and burrow use. Preliminary studies on burrow activity indicate that more than one bilby uses a particular burrow and that bilbies can use more than one burrow per night. This study using a remote microchip scanning plate placed at the entrance of burrows to record the timing and use of burrows by individual bilbies. Results can be used to estimate how many active burrows are equivalent to one bilby and assist with population monitoring. Results will be compared to trapping and track transects.

- *Comparative thermal properties of nests and burrows within the Arid Recovery Reserve.*

Extreme temperatures are recorded during the summer months at Roxby Downs with high mortality recorded in Stick-nest Rats during extended hot periods. Radio-collars and tail transmitters fitted with temperature sensors will be placed on individual rats, bilbies and bettongs to determine how temperature influences activity and mortality. Temperatures inside and outside nest and burrow sites will be recorded during a range of ambient temperatures. Daily peaks and troughs in temperature will be investigated and the position of nests and burrows will be compared with their insulation properties.

## Biological monitoring sites

The monitoring of plants and animals within the Arid Recovery Reserve increased significantly during 2001 from 114 to 371 (Table 2) and now includes sites measuring the growth of seedlings and the recruitment of perennial plant species. The number and length of track transects were also increased in 2001 to include feral animals in the buffer zone around the Reserve.

Table 2: Type and number of monitoring sites in the Arid Recovery Reserve area during 2001

Type of monitoring site	Method	No.	Reason
Plant	Jessop transects, step point, species list, photopoint and abundance	29	Investigate regeneration of native plants after removal of rabbits and domestic stock
Plant	small exclosures	4	Investigate effect of stick-nest rats on survival and recruitment of <i>Gunniopsis quadrifida</i>
Plant	small exclosures	3	Investigate effect of stick-nest rats on vegetation in preferred habitat areas.
Plant	seedling counts	280	Investigate impact of stock, rabbits and re-introduced species on recruitment of seven perennial plant species.
Small vertebrates	pitfall sites	29	Investigate response of native animals to removal of introduced herbivores and predators
Birds	bird transects	12km	Investigate response of birds to removal of feral cats and rabbits including increases in structure and vegetation cover and lower predation levels.
Birds	mist netting	3	Investigate site fidelity, longevity and habitat preference of native bird species
Birds	bird Atlas sites	6	Investigate the effect of cattle grazing on bird life.
Feral cats, foxes, rabbits	track transects	28km	Investigate the temporal changes in feral animals and determine the efficacy of aerial baiting trials
Re-introduced species	track transects	10km	Investigate temporal changes in abundance of SNR, BB, GB and WBB
Re-introduced species	trapping transect	22 km	Annual trapping to determine population increase
Stick-nest rats	radio tracking	5	Investigate the reproduction, survival, habitat preference of rats in the first expansion area
Stick-nest Rats	nest sites	17	Trapping to determine nest fidelity and relatedness at nest sites.
Greater Bilbies	radio tracking	18	Investigate reproduction, survival, habitat use etc. in the main exclosure and first expansion area
Burrowing Bettongs	radio tracking	18	Investigate reproduction, survival, habitat preference etc. in the main exclosure and first expansion area.
Western-barred Bandicoots	radio-tracking	10	Investigate habitat preference and survival after re-introduction

316 plant, 9 bird, 46 mammal and reptile long term monitoring sites. Total = 371

Total animals radio tracked in 2001 = 64

Fauna sites are located with vegetation sites and trapped annually to determine changes in the abundance and diversity of reptiles and small mammals. There are 12 sites situated inside the main exclosure of the Reserve and 11 situated outside. An additional 6 sites are located within

the expansion areas but are not included here as rabbit eradication has only just been completed and differences would not be expected. A total of 453 small mammals and reptiles were captured during the 2001 survey from all 29 sites, a trap success of 18.5%. Results from the first three years of animal trapping (pitfall and Elliott traps) have revealed little difference in native fauna captures between sites inside and outside the exclosure (Fig.17). However, during 2001 significantly higher numbers of native mammals were recorded at sites within the Reserve than outside ( $t=2.482$ ,  $df=21$ ,  $P<0.05$ ). The majority of these captures were made up of the Spinifex Hopping Mouse, *Notomys alexis*. This species had not been previously recorded in the region prior to 1998 and was first discovered inside the Arid Recovery Reserve. Numbers have since increased to extremely high levels within the Reserve possible due to an abundance of grasses since the removal of rabbits. Track transects at burrow entrances inside and outside the Reserve also indicate higher small mammal numbers within the Main Exclosure (Fig. 18).

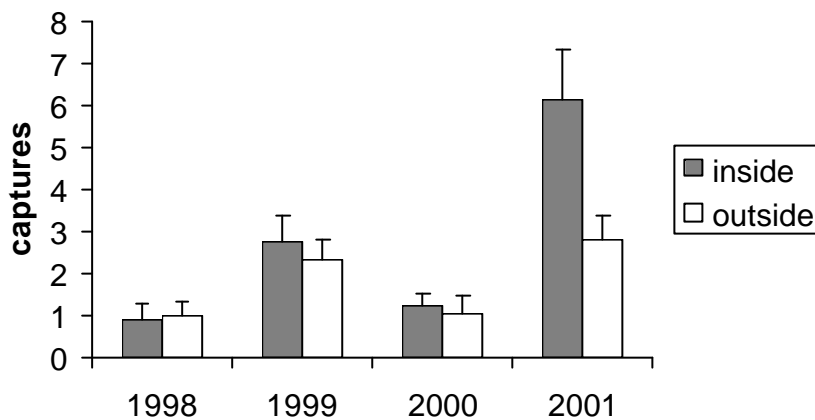


Fig. 17: Average no. of native mammals captured at inside and outside pitfall and Elliott sites. Total number of sites was 12 inside and 12 outside.

Reptile captures show little difference between inside and outside sites (Fig. 19) with the high reptile captures attributable to changing the annual trapping from April to February. Some reptile species may be favoured by low cover and many reptiles respond to change in structure rather than vegetation cover. During 2002, reptile data will be analysed further to determine if any individual species are responding.

Bird numbers are monitored in April each year by the University of Adelaide. Results have not yet been analysed but bird species richness and abundance of some species are thought to be higher within the Reserve. Scarlet-chested parrots were recorded within the Reserve for the first time in 2001. This species is listed as Rare in South Australia and is the first record of the species from Roxby Downs. Other notable bird species recorded in 2001 include breeding records of rufous songlarks, inland dotterals, brown falcons, little crow, crimson chats and white-browed woodswallows and records of bustards, spotted harriers and brown songlarks.



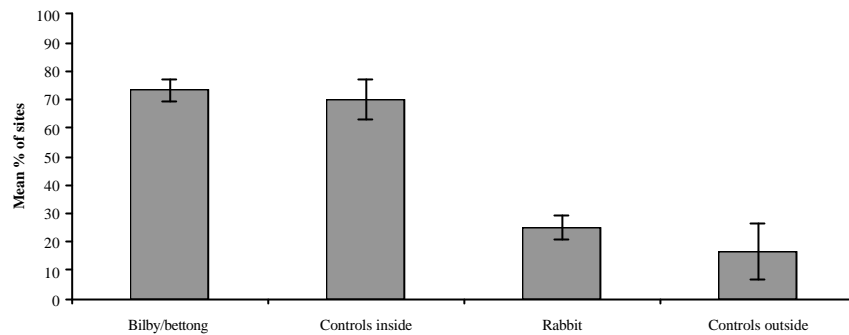


Figure 18: The average number of sites where small mammal tracks were recorded at their entrance per day. There was a total of 16 bilby/bettong warren sites inside the Reserve and 16 rabbit warren sites outside. There were 8 control sites inside and 8 outside the Reserve.

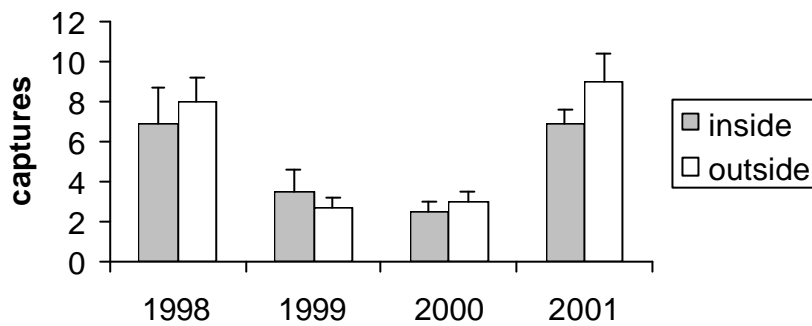


Fig. 19: The average number of reptiles captured at inside and outside sites. Bars indicate standard error.



Flocks of Cockatiel took advantage of the good winter rains and were commonly recorded within the Reserve in 2001.

## Publicity, education and community awareness

Nearly 200 media items have been generated by the Arid Recovery Project since 1997 with 36 items of publicity recorded in 2001 (Table 3). The majority of media interest focused on the re-introduction of locally-extinct mammals. School children from the Roxby Downs Area School were involved in the project in 2001 through National Science Week talks, work experience students, nocturnal tours and activities. The Arid Recovery project is increasingly featured on WMC itineraries for visitors including project tours and BBQ's. Other visits this year included members of the Kanyana Wildlife Sanctuary, local Pastoralists, S.A. Museum staff, Friends groups, WMC board members, Outback Field Naturalist Club, Aboriginal Lands Trust, Four Wheel Drive groups, Arid Lands Botanic Gardens, Pembroke College, Adelaide University and the University of South Australia (Table 4).

Table 3: Items of publicity generated by the project in 2001

<b>Medium</b>	<b>Date</b>	<b>Media Group</b>	<b>Item</b>
Radio	February 2001	ABC Pt Augusta	Interview re: bilby progress
	March 2001	ABC Pt Augusta	Interview re: Triathlon (ARP fundraiser)
	July 15, 2001	5CK Pt Augusta	Interview Davpt Aboriginal Community
	October 8, 2001	ABC Sydney	Interview re: wbbs and Arid Recovery
	October 17, 2001	ABC Pt Augusta	Interview re: Wbbs and project status
	October 26, 2001	ABC National	Interview re: Wbb and Aust Geo
	Nov 14, 2001	ABC regional	Friends group recipient of S.A.Great Award
Print	March 2001	Advertiser	Article re: successful bilby release
	March 2001	Greening Australia Yearbook	Article re: project
	February 2001	Northern Sun	Article re: project update
	February 2001	Dam News	Article re: Triathlon and update
	March 2001	Red Dunes newsletter	Article re: Triathlon
	March 6, 2001	Advertiser	Article re: Bilbies and project progress
	March 2001	Northern Sun	Article re: Triathlon
	March 2001	Dam News	Article re: Triathlon
	May 18, 2001	Northern Sun	Article re: open day at ARP
	May, 2001	Helix Magazine	Article on project on page 2

	May, 2001	Nature Foundation S.A.	Article on A RP
	May 2001	Dam News	Article re: WBB release
	June 2001	Red Dunes	Article re: WBB release
	July 2001	Time Magazine	Article on rabbits and RCD including ARP
	July 13, 2001	Northern Sun	Article on Green Corp Team
	July 2001	Lumen Magazine	Article on Bilbies
	August 1 2001	Science Daily Magazine	Article on Bilbies
	August 2001	Landcare awards	Finalist for Community Group category
	October 2001	Red Dunes	Article on Aust Geo WBB sponsorship
	October 10, 2001	Advertiser	Article on Aust Geo WBB sponsorship
	October, 2001	Australian Geo	Article on Aust Geo WBB sponsorship
	December, 2001	Australian Geo	Article of Aust. Geo WBB sponsorship
	October, 2001	The Australian newspaper	Article on wbbs and Aust Geo sponsorship
	October, 2001	Daily Telegraph	Article on wbbs and Aust Geo sponsorship
	Nov 23, 2001	Dam News	Article on viewing hide
	Dec, 2001	Bulletin	Article by Davo Blair
Television	March 23, 2001	WMC	Footage for WMC AGM
	September 2001	French Film Crew	Footage for documentary on feral animals
	October 2001	Channel 7	Interview with Howard Whelan from Aust Geo re bandicoot sponsorship

Table 4: public events and visits at Arid Recovery in 2001.

<b>Date</b>	<b>Event</b>
February 19, 2001	Adelaide University volunteers- annual monitoring of mammals and reptiles
March 18, 2001	Triathlon fundraiser which raised over \$900 for the project and 88 participants
March 17, 2001	Stall at market Day, Roxby Downs
March 19, 2001	Dinner for WMC and Vattenfall Group from Sweden at project site
April 1, 2001	Display at National Parks Open Day at Belair National Park
May 2, 2001	Visit by Government organizers of radioactive waste dump
May 2, 2001	Metallurgical conference dinner, 20 people, at ARP
May 2, 2001	Western-barred Bandicoot release attended by 38 people

May 7, 2001	Roxby Area school visit, yr 8 for National Science Week
May 9, 2001	Roxby Area School visit, yr 9 for National Science Week
May 10, 2001	Roxby Area School, talks given to junior school re biodiversity and ARP
May 11, 2001	Roxby Area School visit, yr 7 for National Science Week
May 13, 2001	ARP Open Day attended by 50 people
May 17, 2001	Visit by WMC managers Gary Baldwin and Peter Johnson
May 22, 2001	Visit from Kanyana Wildlife Rehab Centre, WA
June 2001	Poster presentation at Australasian Vertebrate Pest Control Conference
June 2001	Training in radio tracking bilbies for Venus Bay NPWS release
July, 2001	Training group from Aboriginal Lands Trust including reps from Coober Pedy, Pt Augusta, Nepabunna and Marree. 1 week training at the site.
July 13, 2001	Green Corps launch at ARP site, Barry Wakelin attended, Federal member for Grey
July 12, 2001	Talk at the Roxby Downs Field Naturalists Society re project update
July 18, 2001	Visit from Roxby Downs Area School after school care group
July 16-20, 2001	Training group from the Aboriginal Lands Trust completed 5 days training at ARP
August 6, 2001	Friends group visit to see the WBBs
August 2001	Finalist in the S.A. Landcare Awards in community group category
August 12, 2001	Visit from Friends of the Arid Lands Botanic Gardens 25 people
August 12, 2001	Visit from S.A. Museum Fungi members, camped at the site
August 15, 2001	French Film Crew filmed rabbit control at the project site
August 25-27	Students from University of S.A. conducted flora monitoring at the ARP site
August 27-31	Craig Baulderstone from DEH conducted veg monitoring at the site
August, 2001	Talk by Friends group president, Peter Paisley, at the Friends Forum in Ceduna
Sept 5, 2001	WMC BBQ and visit at the ARP site
Sept, 2001	University of S.A. students conducted research at the site
Sept 24, 2001	Visit from Pembroke students and families- 20 people
Sept 24-28, 2001	Adelaide University students conducted annual trapping and research
Sept 28, 2001	Group from Transceiver Services camped at the ARP site
Oct 10, 2001	Central Hills 4WD Club visit - 30 people

Oct 20, 2001	Pastoralist Dinner with viewing of Bilbies and bandicoots- 20 people attended
Nov 13, 2001	S.A. Great Awards- ARP Friends group won the Science and Environment prize
Nov 3, 2001	Talk by John Read, WMC Arid Recovery rep. at the Birds Australia Conference
Dec 2, 2001	Talk by Katherine Moseby, project coordinator, at the Aust. Wildlife Manag. Society conference
Dec 7, 2001	Green Corp graduation at Whyalla regional office, attended by ARP staff, parents and trainees

The project increased its public awareness and education campaign during 2001 with information disseminated to a wider audience through a range of media (Table 5).

Table 5: Education and awareness initiatives generated by the project to date (from 1998)

<b>type of publication or activity</b>	<b>details</b>	<b>target audience</b>	<b>Total to date</b>	<b>2001</b>
Info brochures		General public	4000	1000
Info displays	Glendambo Field Day	Pastoralists	1	
	National Parks festival	General public	3	1
	Environmental Expo	General public	1	
	Roxby Downs Market Day	Roxby Downs community	6	1
	WMC Family Day	Mining community	2	
	Roxby Pageant Float	Roxby Downs community	1	
	World Environment Day	School children	4	
	National Science Week	School children	1	1
	Olympic Dam Expansion	WMC employees	1	
Talks	Friends of the Arid Lands BG	Conservationists	3	1
	Natural Resource Management Forum	Pastoralists	1	
	National Parks Forum	National Parks staff	1	
	World Environment day	Roxby Downs school students	5	
	Northern Industries Forum	Mining and industry delegates	1	
	Field Naturalist Society	Roxby Downs community	1	1
	Friends of Parks Forum	General public	1	1
Scientific Conferences	Resource 2000	Mining Scientific community	1	
	Mammal Society of Australia	Scientific community	1	
	Ecological Society of Australia	Scientific community	1	
	Rangelands Society	Scientific community	1	
	Australian Wildlife Management	Scientific community	1	1
	Birds Australia	Scientific community	1	1
	Australasian Vertebrate Pest	Scientific community	1	1
University camps	University of Adelaide	University students	5	2
	University of South Australia	University students	2	1
School educational visits		School children	15	3
Green Corp		Youth	4	1
Indigenous training camps		Aboriginal groups	2	1
Open days, working bees		Friends members, general public	9	2
Media articles		General public	199	36
Permanent Displays		Visitors	3	3

## Volunteers and community involvement

Over 370 people have actively assisted the Arid Recovery Project on a voluntary basis since its inception in July 1997. Participants came from a wide range of backgrounds and include:

- Friends members and volunteers >120
- WMC Resources staff- 15
- University of Adelaide students- 81
- University of S.A. students- 25
- National Parks staff and Government staff- 10
- CVA/Greencorp trainees- 85
- Members of Indigenous organisations- 35

### Friends of the Arid Recovery Project

The Friends of the Arid Recovery Project now has over 120 member households with members from as far afield as W.A. and New Zealand. Membership includes WMC employees, primary, secondary and tertiary students, local pastoralists and soil boards, general public, National Parks Friends groups and employees, 4WD Clubs, Australian Geographic and local businesses. The Friends group produces a quarterly newsletter which is distributed to all members and sponsors. The group coordinates volunteer involvement in the project, organises fundraisers and conducts working bees.

Fundraisers during 2001 included a Roxby Downs Triathlon (\$1000), selling t-shirts and stubby holders, initiating a sponsorship program for individual animals, running the bar at the Glendambo B&S Ball (\$1500) and securing sponsorship from Australian Geographic (\$10 000).

Other activities organised by the Friends group this year included coordinating the bandicoot releases, assisting with rabbit control and fencing and helping monitor the released animals. Members of the Friends group also organised and staffed information displays at National Parks Expo and Roxby Downs market days.

During 2001, the Friends group applied for 10 grants (Table 6) and received over \$50 000. Many local businesses also sponsored the Arid Recovery Project through the use of their goods and services. Macro Meats (kangaroo meat producers) are donating 15% of the profits of kangaroo sales above base sale levels in Roxby Downs to the Arid Recovery Project.

The Arid Recovery Project supports the ecologically sustainable harvesting of kangaroos for meat production and always purchases kangaroo meat for Friends group functions and visitor BBQs



**A friends group volunteer, Katherine Brownley, with a young bilby**



Table 6 : Grants applied for and monies received/secured by the Friends Group during 2001

<b>Grant</b>	<b>Amount</b>	<b>Received (or secured)</b>
WWF Threatened Species Network	3 900	3 900
International Year of Volunteers-11	3 557	0
International Year of Volunteers-1	2 500	0
Native Vegetation Fund	5 850	5 850
Friends of Parks – info signage	3 010	1 000
Friends of Parks – wbb grant	3 420	3 000
Natural Heritage Trust - Bushcare	19 000	12 000
Rangeland Action Project	10 560	6 650
NHT – Rabbit Abatement	19 000	19 000
Wildlife Conservation Fund	3 952	awaiting results
<b>Total</b>	<b>74 749</b>	<b>51 400</b>

### **Aboriginal Lands Trust**

Fifteen members of the Aboriginal Lands Trust attended a training camp held at the Arid Recovery Project in July 2001. The trainees were from Aboriginal lands across the state including Cooper Pedy, Nepabunna and Pt. Augusta and were trained in feral-proof fencing, feral animal control, vegetation monitoring, radio-tracking and endangered species trapping. The training camps are conducted in association with the Aboriginal Lands Trust and are designed to encourage and assist Aboriginal groups with planning similar conservation ventures on Aboriginal Land. All members appeared to enjoy and benefit from the camp and another camp is planned for 2002.

### **Green Corps/CVA**

One Green Corps teams was based at the project during 2001. The team was led by Annette Damon and spent 14 weeks at the Reserve. The 10 member team completed numerous tasks including building a second release pen adjacent to the original 8ha pen, removing the old mine lease fence within the Reserve, rabbit control in the buffer zone, building a viewing hide, carpark and walkway, installing a pipeline for the ephemeral soak, radiotracking, conducting a weekly fence check, clearing vegetation from the fenceline and assisting with monitoring.



Arid Recovery Staff with the Member for Grey, Barry Wakelin and the Green Corp team based at the project site.

The Green Corps teams were housed at the WMC single persons' quarters at Camp 1 where the team assisted with landscaping and paving in part exchange for accommodation costs. Three Green Corp teams have now completed their 14 week training at the Reserve and there are currently no plans to apply for any subsequent teams. The fencing and feral animal control has been completed within the Reserve and there are now limited activities suitable for Green Corp teams.

## University of South Australia

A group of 25 students from the University of S.A. conducted their arid zone ecology camp at the Reserve in August 2001. The students assisted with the annual vegetation monitoring within the Reserve as well as trapping Stick-nest Rats and translocating them to the first expansion area. The students were also given a talk on arid zone ecology and were given a night tour of the Reserve and a surface tour of the Olympic Dam Metallurgical Plant.

## University of Adelaide

Three groups of University of Adelaide students visited the project during 2001. A group of 10 students assisted with the annual pitfall and Elliott monitoring in February and a group of 5 students assisted with the annual monitoring of re-introduced species at the Arid Recovery Reserve in September 2001. Dr David Paton also accompanied a small group of students in April 2001 to conduct the annual bird monitoring.

## Awards

The Friends group applied for six awards during 2001 including the S.A. Great Regional Awards, the Readers Digest Environmental Award, the AMEEF environmental excellence awards and three S.A. Landcare Awards. The project was successful in receiving the S.A. great regional award for Science and Environment and was a finalist in the S.A. ALCOA Landcare Community Group Award. Arid Recovery staff also received a Dam Best award from WMC Resources.



**The Friends group was a runner-up in the S.A. Community Group Landcare Awards in 2001. Brydie Hill and Lydia Paton from the Friends of the Arid Recovery Project accepted the certificate at a luncheon in Adelaide.**

## 2001 Budget

### **Contributions**

Over \$450 000 in kind and monetary contributions were received from 29 organisations in 2001 (Table 7). Monetary contributions comprised over 60% of the total contributions, with WMC and the Natural Heritage Trust the major contributors. WMC was the largest single monetary contributor, donating 52% of the monetary contribution. However, the Friends group privately raised 48% of monetary costs. Most of the WMC funds were used for wages and a new 4WD Hilux.

In kind contributions represented nearly 40% of the total contributions to the project in 2001. Fifteen businesses and organisations contributed in kind to the project compared with 10 in 1999. Major in kind contributors included Greencorp, the Friends group, and the University of Adelaide (Table 8). In kind contributions involved the donation of volunteer labour for plant, animal and endangered species monitoring, veterinary assistance and quarantine facilities, research, fencing, road construction, fuel, feral animal control, car parts and food. In kind labour contributions are valued at \$15 per hour for unspecialised labour and \$25 per hour for professional labour, following standard Natural Heritage Trust recommendations outlined by the Commonwealth Government. Professional in kind contributions include re-introduction organisation by DEH staff, time donated by University of Adelaide and DEH committee members and volunteer supervisors.

### **Expenditure**

Major expenditure items included a new 4WD Hilux and wages (Table 7). Wages include two full time positions comprised of one full time project coordinator and 2 part time project officers. A research officer was also employed part time to assist with monitoring and research for specific projects. Other major expense items were radio-collars and transport of threatened species, fuel for the 4WD and volunteer associated costs such as fuel and food reimbursements. A significant amount was spent on tourism infrastructure in 2001 in readiness for tours beginning in 2002. A viewing hide and soak was installed within the first expansion area and road upgrades were also completed.

## Proposed Budget and Workplan 2002

### **Annual contributions and expenditure**

Over \$200 000 of funding has already secured for 2002 (Table 9). Major contributors are WMC Resources and the Natural Heritage Trust with significant monetary contributions from the Dept for Environment also received for the first time.

The main project costs in 2002 will be wages, fuel, feral animal control and endangered species re-introductions and monitoring. The project will begin to focus more on research and information dissemination now that fencing and feral animal eradication is complete. Aerial baiting trials will also form a significant cost during 2002.

Annual in kind contributions in 2002 are expected to decrease now that Green Corps teams will no longer be based at the site. However, Friends group in kind contributions are expected to increase as more research students conduct research scholarships with the project.

**Table 7: Arid Recovery Project: Contributions and Expenditure during 2001. \* = indicates money received for 2002. ^ = includes \$40 000 already allocated to projects starting in 2002.**

CONTRIBUTIONS	2001 monetary	2001 in kind	2001 total
WMC Resources (operating)	<b>111 038</b>		111 038
WMC Resources (capital)	<b>38 000</b>		38 000
Dept. Environment		2 040	2 040
University of Adelaide		12 700	12 700
University of South Australia		9000	9000
Friends of the Arid Recovery Project		67 740	67 740
- opening balance of bank account	<b>26 694</b>		26 694
- fundraisers and membership	<b>4 298</b>		4 298
- Interest	<b>1 097</b>		1 097
- re-imburements	<b>419</b>		419
- donations	<b>1 573</b>		1 573
<b>Grants</b>			
- Friends of Parks	<b>5 000</b>		5 000
- Natural Heritage Trust : Bushcare	<b>12 000*</b>		12 000"
- NHT : Rabbit Abatement	<b>58 990</b>		58 990
- Native Vegetation Fund (DEH)	<b>4 095</b>		4 095
- Rangeland Action Project	<b>6 045</b>		6 045
- WWF Threatened Species Network	<b>1 290</b>		1 290
- Wildlife Conservation Fund	<b>1 344</b>		1 344
<b>Sponsorship</b>			
- Macro Meats	<b>214</b>		214
- Australia Geographic	<b>10 000</b>		10 000
Aboriginal Lands Trust	<b>4000</b>		4000
Royal Zoological Society of S.A		3 000	
Lavricks engineering		387	387
Specialised tyres		865	865
Olympic Dam Transport		1550	1550
Wreckair Hire		250	250
Eurest		300	300
Cowell Electric		150	150
Heading Contractors		1 000	1 000
Tubemakes Roxby Downs		200	200
SDS		250	250
Green Corps		71 400	71 400
Roxby Downs Area School		180	180
<b>Total Contributions</b>	<b>286 097</b>	171 012	454 109
<b>EXPENDITURE</b>			
<b>wages</b>			
project coordinator and project officers	<b>121 817</b>		
contractors wages and equip hire			
<b>operating</b>			
Minor capital items			
Vehicle running costs and fuel	<b>9 254</b>		
Endangered species re-introds and research	<b>13 607</b>		
General stores	<b>2 371</b>		
Communications	<b>500</b>		
Volunteer travel/accommodation	<b>8 505</b>		
Bank Fees	<b>95</b>		
Information displays and brochures	<b>1 440</b>		
Feral animal control	<b>4 437</b>		
Tourism infrastructure (hide, roads etc)	<b>11 278</b>		
<b>capital</b>			
4WD Toyota Hilux	<b>38 000</b>		
Fencing materials	<b>4 137</b>		
<b>total expenditure</b>	<b>215 441</b>		
<b>funds remaining</b>	<b>70 656^</b>		

**Table 8: Annual In Kind Contributions**

<b>Contributor</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002 forecast</b>
Pastoral Management Branch	520	1 760	0	0	0
DEH"	3000	3 400	1 700	2 040	3 000
University of Adelaide	21 000	36 120	17 300	12 700	7 000
University of South Australia		14 400		9 000	8 000
Lavricks Engineering		1 200	660	387	
Northpoint Toyota		1 000			
Coates Hire		2 000			
Specialised tyres		800	1 000	865	800
Royal Zoological Society of S.A.			4 000		
BP			100		
Olympic Dam Transport		1 000	2 180	1 550	1 000
Wreckair hire			200	250	300
SBS			340		
Eurest			550	300	300
Cowell Electric			150	150	150
Olympic Dam Tours			400		
Trek About Tours			400		
Foodland			60		
Readymix			855		
Heading contractors				1 000	
Tubemakers Roxby Downs				200	
SDS				250	
Roxby Downs Motor Inn			50		
Conservation Volunteers Australia		13 200	2 400		
Gary Baker Building			1 500		
CALM W.A.			5 000		
Aboriginal Land Trust		1 800	4 000		4 000
Greencorps	8 400	38 400	135 600	71 400	0
Roxby Downs Area School	985	2 370		180	200
Community	5030	**	**	**	
Friends of the Arid Recovery Project	18 945	30 774	63 845	67 740	70 000
Primary Industries S.A.	700	350	1100		
Royal Zoological Society of S.A.				3 000	
CSIRO W.A.		2 000			
<b>total</b>	<b>58 580</b>	<b>144 574</b>	<b>243 390</b>	<b>171 012</b>	<b>84 750</b>

\*\* now included in Friends Group

" This in kind contribution does not include costs of maintaining breeding colonies of endangered species or genetic data bases. These costs would be considerable.

**Table 9: Annual Financial Contributions. \*=Funds Already Secured for 2002**

<b>Income</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001 budg.</b>	<b>2001 actual</b>	<b>2002 prop.</b>
WMC Resources (operating)	32 344	116 500	167 467	115 000	<b>111 038</b>	160 000
WMC Resources (capital)					<b>38 000</b>	0
Land Management Research Grant			21 080			
Dept. Environment	18 000	4 420	3 700	5 000		12 000*
University of Adelaide		3 000	2 540	2 000		
Prizes/ awards	2 000					
BHP		35 000				
Friends of the Arid Recovery Project						
- opening balance of bank account		1 953	3 489		<b>26 694</b>	70 656
- fundraisers and membership		3 953	12 096	6 000	<b>4 298</b>	3 000
- Interest					<b>1 097</b>	500
- re-imburements					<b>419</b>	
- donations					<b>1 573</b>	1 000
<b>Grants</b>						
- Friends of Parks			1 000	1 000	<b>5 000</b>	1 000*
- Natural Heritage Trust : Bushcare		29 991	28 030	69 500	<b>12 000*</b>	
- NHT : Rabbit Abatement					<b>58 990</b>	19 000*
- Native Vegetation Fund (DEH)					<b>4 095</b>	
- Rangeland Action Project					<b>6 045</b>	
- National Parks Foundation		2 750	7 470			3 500
- WWF Threatened Species Network		3 930	11 610		<b>1 290</b>	3 900*
- Friends of Parks Directors grants			1 000			
- Wildlife Conservation Fund			4 050	2 240	<b>1 344</b>	
<b>Sponsorship</b>						
- Macro Meats		164	102	500	<b>214</b>	200
- Australia Geographic					<b>10 000</b>	
Dog Fence Board			13 500			
Aboriginal Lands Trust			2 350	2 000	<b>4 000</b>	
Wesfarmers			300			
Royal Zoological Society of S.A			1 000			
<b>Total income</b>	<b>52 344</b>	<b>207 661</b>	<b>280 784</b>	<b>204 440</b>	<b>286 097</b>	<b>274 556</b>
<b>Expenditure</b>						
<b>wages</b>						
project coord, project officers, research officer	61 101	79 601	90 490	95 000	<b>121 817</b>	130 000
contractors wages and equip hire	2 723	10 506	0	0		
<b>operating</b>						
Minor capital items		13 466	7 702	5 000		5 000
Vehicle running costs and fuel		7 868	10 855	15 000	<b>9 254</b>	12 000
Endangered spp. re-introductions and research	2 372	10 629	16 241	10 000	<b>13 607</b>	20 000
Fauna and veg monitoring				10 000		5 000
General stores		6 038	323	1 000	<b>2 371</b>	7 000
Communications		122	274	300	<b>500</b>	500
Volunteer travel/accommodation	1 389	4 933	4 576	8 000	<b>8 505</b>	10 000
Fundraiser outlays		1 295	2 240	3 000		1 000
Bank Fees			107	100	<b>95</b>	100
Information displays and brochures		1 460	338	3 000	<b>1 440</b>	7 000
Feral animal control		2 730	4 153	4 000	<b>4 437</b>	15 000
Fencing equipment		3 097	1 992	1 000		
Equipment hire		2 110		1 000		
Freight	1 045			500		
Electric fencing contractor		2 896				
Fence maintenance		5 000	2 000	3 000		4 000
Polypipe and Soak materials				7 000		
Tourism infrastructure (hide, roads etc)				10 000	<b>11 278</b>	3 000
Incidentals		290		1 000		1 000
<b>capital</b>						
4WD Toyota Hilux					<b>38 000</b>	
Fencing materials	8 234	59 079	110 000	5 000	<b>4 137</b>	5 000
4 wheel motorbike			6 000			10 000
<b>total expenditure</b>	<b>76 864</b>	<b>211 120</b>	<b>255 591</b>	<b>203 900</b>	<b>215 441</b>	<b>235 600</b>
<b>funds remaining</b>	<b>\$-5 396</b>	<b>\$-3 459</b>	<b>\$25 493</b>	<b>\$540</b>	<b>\$70 656</b>	<b>\$ 38 956</b>

## Long Term Objectives and 2002 Workplan

Core tasks required to achieve the project aims are outlined in Appendix A. A total of 555 working days are required. There are approximately 225 working days in a year, indicating that the project requires a minimum of two full time staff.

The following long term objectives have been formulated based on the project aims on page 1. These will be implemented gradually according to time and funding commitments but the proposed 2002 outcomes for each objective are outlined below.

### *Fencing and maintenance*

Objective: Continue to exclude rabbits, cats and foxes from the Reserve through regular checking and maintenance of the fence

Although the fencing and feral animal eradication is now complete, the fence requires weekly monitoring and maintenance. Checks for feral animal tracks within the Reserve must also be conducted on a regular basis including dune traverses on the bike every 6 months to check for rabbit tracks.

### *Feral animal control*

Objective: A buffer zone of 10km around the enclosure where cats and foxes are controlled. A buffer zone of 500m around the enclosure where rabbits are controlled.

Aerial baiting trials will commence in 2002 and include a 10km baited zone around the fenceline. Audio lures and leg hold traps will continue to be set around the Reserve perimeter and checked daily using biotelemetry. Monthly spotlight counts and track transects around the Reserve will be conducted to determine the rabbit, fox and cat pressure on the fence. Rabbit control will include 1080 oat baiting and warren destruction.

### *Monitoring*

Objective: 1) Annual monitoring of the impacts of feral and re-introduced species on the native vegetation through the use of photopoints, vegetation transects, exclosures and seedling recruitment, growth and survival studies.

2) Annual monitoring of condition, density and reproductive status of native and re-introduced animals through track and fixed trapping transects, radio telemetry and opportunistic trapping.

Seedling monitoring sites are already established in areas of cattle, rabbits, re-introduced species and controls. These sites will be used to determine growth rates and germination of native plant species.

Small mammal/reptile trapping and plant monitoring sites will be conducted in February and August respectively. Re-introduced species are now being monitored through track transects and trapping transects in September. Radio tracking will continue to be used during translocations to expansion areas.



### *Threatened species re-introductions*

Objective: The re-introduction of locally-extinct plants and animals depending on availability, ecosystem recovery, funding etc. Gradual access of re-introduced species to the entire 60km<sup>2</sup> Reserve.

The 8km<sup>2</sup> second expansion area will be kept free of all introduced and re-introduced species at present to act as a control for monitoring and research studies. Re-introduced species have already been translocated to the first expansion area through controlled re-introductions. Further translocations will commence in 2002 with some species also given access to the northern expansion area.

A second release of Western-barred Bandicoots may be implemented in 2002 from W.A. source populations. However, this will depend on the status of the virus currently being investigated in island and captive populations. Genetic studies will be conducted on all re-introduced species five years after re-introduction, to determine population founders and the extent of inbreeding. Third generation individuals have been recorded from Burrowing Bettongs, Greater Bilbies and Stick-nest Rats indicating that these three species have been successfully re-introduced.

### *Education, Tourism and Public Awareness*

Objective: 1) Develop tourism within the first expansion area. Tourism will be coordinated by local tour operators.

2) Establish training and education camps at the project site.

Tourism access is being restricted to the first expansion area and will be conducted by local tour operators beginning in April 2002. The Friends group will receive a proportion of the profits. Tours will include a walk along an interpretive walkway to the viewing platform, a talk about the project, BBQ dinner and/or drinks and an hour in the viewing hide to observe the nocturnal animals. The general public will also have unrestricted access to the information displays situated next to the main gate on the Borefield Road.

Training and education camps will be available for schools, universities, indigenous groups, Green Corp trainees and volunteers and will cover various levels of land management including feral animal control, fencing, endangered species monitoring, vegetation monitoring and research. To date the following activities have been organised but more will be planned as the year progresses:

- Update information displays present along the Borefield Road, which is used extensively by tourists during the winter months.
- Update the project brochure and distribute 2000 copies
- The 2001 annual report will be distributed to all contributors and potential sponsors.
- Two scientific papers will be published
- Scientific research papers on the project will be presented at conferences throughout Australia.

- One group from the Anangu Pitjantjatjara Lands will be visiting the site this year and receiving training in endangered species management from Arid Recovery staff.
- The portable information display and touch table will be displayed at the National Parks Festival, Glendambo Field day, Roxby Downs market days and other events.
- Articles are being prepared for Australian Geographic and other widely read magazines.
- At least two research students from Universities throughout Australia will conduct research at the Reserve this year.
- Exposure will be increased through organised tours by Trek-about Tours.

### *Research*

Objective: Coordinate research on the restoration of ecological processes and use results for adaptive management of the project. Disseminate information to other conservation and industry groups to improve management of arid lands.

Current research topics for 2002 were outlined in the Research section earlier. Research projects will be conducted using a combination of volunteers and scientists. An application to obtain Earthwatch volunteers has been submitted with trips due to start late in 2002. These volunteers travel from around the world to assist with conservation and research projects. The Arid Recovery Project application is for Earthwatch volunteers to assist with research into reptile, native mammal and plant species. Volunteers may also assist with annual monitoring.

### *Fire, drought and flood contingency plans*

Objective: Establish soak areas for limited use only during drought conditions. Maintain fire break around fenceline.

Maintenance of a fire break around the enclosure by removing all vegetation within 3 metres of the outside of the fence. Vegetation along the fenceline has increased enormously during 2001 due to the high rainfall. Efforts are being made to clear the vegetation but it is very time-consuming due to the length of the fenceline (34km). Flood gates have been installed in case of flooding. If flooding does occur, the fenceline will be checked as soon as practical using four wheel motorbikes to enable timely repairs.

Although some mortality of plants and animals during natural droughts is expected and natural, fenced enclosures do not allow animals to naturally disperse long distances to look for food and moisture. Prior to European settlement, droughts and patchy rainfall in the arid zone would have forced animals to move to recent rainfall areas or eventually become locally extinct. If local extinction occurred these areas would have been recolonised by animals from adjacent areas. However due to the imposition of a fence around the enclosure these natural processes cannot occur and the project will use soaks to mimic isolated rainfall events and prevent mass mortality during long droughts. One soak has already been installed within the first expansion area of the Reserve near the viewing hide. The soak is a take-off from the ODC water pipeline and approximately 1km of polypipe has been buried to supply the soak. The polypipe is attached to sections of "leaky hose" which are buried to provide seeping water to underground roots. No free water will be provided and soaks will be turned on and off as required. Decisions on timing and duration of soaks will be made by the committee based on information on recent rainfall, vegetation condition and mortality of re-introduced species.

## Appendix A: Priority tasks

Priority aim	Method	Frequency	Duration (days)	No. people required	Annual total (days)
Maintain fenceline	Fence check	weekly	1	1	52
	Fence maintenance	as required		1	10
	Check electrics, fix faults	daily	.01 + 6	1	9.65
	Firebreak around enclosure	biannually	3	2	6
Keep enclosure rabbit-free	Check all 4 project areas for rabbit tracks	biannually	10	2	20
	Remove any re-established rabbits	annually	5	1	5
Maintain buffer zone	Set and check cat traps around fence line	daily	.125	1	45.6
	Poison oats for rabbits	annually	10	1	10
	Fumigating within 500m of fence line	annually	5	2	10
	Fox/cat baiting	biannually	2	2	4
Monitor restoration of in situ species	Standard vegetation monitoring sites	annually	5	2	10
	Additional vegetation enclosure sites	annually	3	2	6
	Standard reptile/mammal monitoring sites	annually	6	2	12
	Kangaroo census and cull	annually	2	2	4
	Bird transects	annually	5	1	5
Monitor re-introduced species	Track transects	biannually	2	1	4
	Trapping transects	biannually	4	2	16
	Radio-tracking	weekly	1	1	52
Ensure information dissemination	Present display at field days, talks	as required	6	1	6
	Present scientific papers at conference	annually	3	1	3
	Coordinate and lead visits	as required	12	1	12
	Enter monitoring data and analysis	annually	5	1	5
	Quarterly reports	quarterly	1	1	4
	Annual report	annually	8	1	8
Increase public profile	Publicity: photos, articles, interviews	monthly	2	1	24
Increase community support, participation	Friends group newsletter, coordination	quarterly	2	1	8
	Organise and supervise volunteers	as required	10	1-2	10
Training and education programs	Universities	annually	5	2	10
	Indigenous groups	annually	4	2	8
	Primary and Secondary schools	annually	4	2	8
	Volunteer coordination and supervision	as required	10	1	10
	Earthwatch, Green Corps, CVA	annually	8	2	16
Maintain and coordinate funding	Grant applications and progress reports	quarterly	2	1	8
	Budget	monthly	.3	1	4
Administration	Ordering, filing, wages, permits	weekly	1	1	52
Research	Supervise research students	2 annually	10 each	1	20
	Conduct research, write scientific papers	2 annually	30 each	1	60